and the lowest, 38°, at Erasmus on the 1st. The average precipitation was 2.94, or 1.31 below normal; the greatest monthly amount, 7.39, occurred at Greenville, and the least, 0.78, at Pope.—*H. C. Bate.*

Texas.—The mean temperature for the State was 0.5° above the normal. There was a general deficiency over the panhandle and west Texas, ranging from 0.1° to 1.2°, and along the coast the temperature ranged from the normal to 1° below, except in the vicinity of Brazoria, where there was an excess. Over other portions of the State there was a general excess, except in the vicinity of Dallas, Waco, Fredericksburg, and New Braunfels, where there was a slight deficiency. The excess ranged from 0.1° to 2.5° over north, central, and west Texas, and from 0.2° to 3.5° over southwest and east Texas, with the greatest in the vicinity of Hearne. The highest was 111°, at Childress on the 24th, and the lowest, 42°, at Sierra Blanca on the 30th. The average precipitation for the State was 0.81 below the normal. There was a general deficiency, except over the northern portion of central Texas, the western portions of north and west Texas, and in the vicinity of Cuero, Luling, San Marcos, and Boerne, where there was an excess ranging from 0.03 to 2.13, with the greatest in the vicinity of Fort Worth. The deficiency ranged from 0.01 to 3.53 over east and southwest Texas, the east portions of west and north Texas, the panhandle, and the southern portion of central Texas, and from 0.91 to 5.55 over the coast district, with the greatest deficit in the vicinity of Houston. The greatest monthly amount, 9.20, occurred at Temple, and the least, trace, at Fort Stockton.—*I. M. Cline.*

Utah.—The mean temperature was 63.2°; the highest was 104°, at Manti on the 22d, and the lowest, 20°, at Soldier Summit on the 2d. The average precipitation was 0.24; the greatest monthly amount, 0.77, occurred at Thistle, and the least, trace, at Cisco and Giles.—*J. H. Smith.*

Virginia.—The mean temperature was 71.7°, or 2.0° below normal; the highest was 103°, at Farmville on the 25th, and the lowest, 30°, at Guinea on the 2d. The average precipitation was 3.18, or 0.50 below normal; the greatest monthly amount, 11.56, occurred at Guinea, and the least, 0.71, at Spottsville.—*E. A. Evans.*

Washington.—The mean temperature was 61.4°, or 2.4° above normal; the highest was 100°, at Kennewick on the 30th, and the lowest, 28°, at Cascade Tunnel on the 14th and 17th. The average precipitation was 2.22, or 0.28 above normal; the greatest monthly amount, 5.33, occurred at North Bend, and the least, 0.30, at Sunnyside.—*E. N. Salisbury.*

West Virginia.—The mean temperature was 69.3°, or about 3.0° below normal; the highest was 96°, at Point Pleasant on the 30th, and the lowest, 35°, at Burlington on the 4th and at Nuttallburg on the 5th. The average precipitation was 4.31, or about normal; the greatest monthly amount, 6.77, occurred at Parkersburg, and the least, 1.31, at Burlington.—*H. L. Ball.*

Wisconsin.—The mean temperature was 63.2°, or 3.6° below normal; the highest was 100°, at Medford and White Hall on the 14th, at City Point on the 15th, and at Prairie du Chien on the 17th; the lowest was 22°, at Barron and Spooner on the 1st. The average precipitation was 5.41, or 1.50 above normal; the greatest monthly amount, 9.86, occurred at Amherst, and the least, 2.95, at Crandon.—*W. M. Wilson.*

Wyoming.—The mean temperature was 60.4°, or about normal; the highest was 104°, at Wamsutter on the 12th, and the lowest, 24°, at Fort Washakie on the 17th. The average precipitation was 1.47, or 0.29 below normal; the greatest monthly amount, 4.19, occurred at Sundance, and the least, 0.03, at Wamsutter.—*M. G. Renoe.*

RIVER AND FLOOD SERVICE.

By PARK MORRILL, Forecast Official, in charge of River and Flood Service.

On June 4th at Vicksburg and on the 9th at New Orleans the Mississippi fell below the danger line; the river had been in flood eighty days at Vicksburg and seventy-five at New Orleans.

All the rivers have now sunk to low summer stages, in many instances interrupting navigation. During the month local freshets of short duration occurred in the rivers of New York and North Carolina.

The highest and lowest water, mean stage, and monthly range at 114 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

The following résumé of river stages and conditions of navigation in the respective streams is compiled from reports by the officials of the Weather Bureau at various river stations and section centers:

Hudson River. (Reported by A. F. Sims, Albany, N. Y.)—The regimen of the Hudson for the month would be uneventful were it not for the fact that the copious rains of the 8th and 9th caused an abnormal June freshet. The river began to rise slowly on the afternoon of the 9th, and by 10 p. m. was within 4 feet of the string-piece of the wharves at Albany, N. Y. The water reached its highest point at 3 p. m. of the 10th, and half the sidewalks on the west side of Quay street were awash. The People's Line Steamer had to make her landing at the high wharf near Van Rensselaer Island, as the upper wharf was submerged. Reports from the tributaries say that the water was over the banks on the 9th, and that many acres of land under cultivation were submerged and considerable damage caused by the overflow.

On the morning of the 10th the water poured over the State dam at Troy to such a depth that the dam could be located only by a slight roughness in the current. The water has not been so high in June for twenty-five years.

Susquehanna River and branches. (Reported by E. R. Demain, Harrisburg, Pa.)—The rainfall averaged only about half the normal amount within the Susquehanna River basin, and consequently the stages of the water in nearly all streams of the system were below the average for June. In the lower Susquehanna a good stage was maintained notwithstanding the long period of dry weather, the water coming mostly from the north branch. At Harrisburg the average gauge reading was only 0.1 foot lower than for June, 1896, while the rainfall during the month was only half as great. On the West Branch exceptionally low stages ruled and at Cedar Run and Sinnemahoning the water was below the zero of the gauge during the entire month. The gauge readings for this part of the system averaged 0.5 of a foot as against 2.1 feet in June, 1896. The Juniata averaged about 1 foot lower than during the same period last year. The North Branch was the only river of the system reporting higher stages than last year, due, doubtless, to a heavier rainfall in the northern counties of Pennsylvania and in New York State.

Rivers of South Atlantic States. (Reported by E. A. Evans, Richmond, Va.; C. F. von Herrmann, Raleigh, N. C.; L. N. Jesunofsky, Charleston, S. C.; D. Fisher, Augusta, Ga.; and J. B. Marbury, Atlanta, Ga.)—The low water prevailing in the James River during May continued throughout June, and no changes of any importance were recorded. The weather over the James River basin was dry, and hence there was nothing to cause any increase in the low stage of water usual at this season. The extreme range of the river on the gauge was from —0.2 to 1.0 feet. On the lower river the water is becoming more than usually brackish, owing to the decrease in the volume of fresh water coming down the river.

The precipitation throughout North Carolina for June was below the normal, and although the number of rainy days was large, and some heavy local rains occurred, the rainfall seemed to have a very slight influence on the stages of the rivers. The stages were irregular, but all low, declining gradually from the highest during the first decade to the lowest during the last. The Roanoke only attained a stage of 10 feet, and that on one date. Navigation of the lower courses of the streams has been limited during the month, as is usually the case during June. Owing to the dry state of the soil, very heavy rains would now be required to cause dangerous rises in the rivers of North Carolina.

The streams of South Carolina were at a very low stage from the 16th to the 30th. There was good steamboat water on the Wateree beyond Camden. Navigation was suspended on the Pedee at Cheraw, from the 16th to the 18th, and from the 27th to the 30th, but continued uninterrupted from Winyah Bay up to Drake. The Congaree was navigable to Granby Falls. There was but little traffic on the Edisto, the Little Pedee, the Lumber and Black rivers, throughout the month, on account of low water. The Lynch and Santee remained at navigable stages.

Heavy rains in the upper portion of this State and in North Carolina on the 6th, 7th, and 8th caused moderate freshets on the upper Pedee, the upper Wateree, the Broad, and Congaree. At Camden the stream rose from a 10-foot stage on the 8th to a gauge reading of 20.0 feet, with heavy driftwood, on the 9th. The rains were unusually heavy in the upper part of Spartanburg County on the 6th and 7th. Lowland crops were covered with water to the depth of 3 to 6 feet, and cultivated lands were badly washed. Two wooden bridges were swept away at Whitney, 10 miles above Spartanburg. Several cotton mills on the

tributaries of the Broad River were compelled to shut down until the freshet passed by.

Less than the average amount of rainfall was received over the upper Savannah Valley during the month, in consequence of which no rise worthy of notice occurred in the river; in fact, for the thirty days the range was hardly 6 feet. This condition favored navigation, but at this season of the year traffic does not amount to a great deal. The crops in the river bottoms are progressing nicely and promise an enormous yield of corn if no disasters from high waters are encountered in the next three months.

Mobile River and branches. (Reported by F. P. Chaffee, Montgomery, Ala., and W. M. Dudley, Mobile, Ala.)—There has been a gradual fall in the Alabama River and its tributaries to the close of the month, when stages at all stations were less than 2 feet. There has been an entire suspension of river traffic above Selma, which, however, is always of little importance at this season.

The Mobile and Tombigbee have continued quite low during the entire month, and navigation on the upper Tombigbee has been difficult. The rains which occurred during the month were confined mostly to the coast district, being in the nature of local thunderstorms, and could, therefore, have no general effect on the rivers. There was but one general rain, on the 3d and 4th, only moderately heavy, and causing a slight rise of short duration, as considerable of the moisture was absorbed by vegetation.

Ohio River and branches. (Reported by F. Ridgway, Pittsburg, Pa.; H. L. Ball, Parkersburg, W. Va.; S. S. Bassler, Cincinnati, Ohio; F. Burke, Louisville, Ky.; P. H. Smyth, Cairo, Ill.; L. M. Pindell, Chattanooga, Tenn.; and H. C. Bate, Nashville, Tenn.)—The Ohio at Pittsburg continued to fall slowly during the first part of the month, and by the 12th had reached so low a stage that it became necessary to raise the wickets at Davis Island Dam. By the last week of the month navigation was practically suspended for all but very light craft. The packet lines were much inconvenienced by the low water, two steamers being so badly damaged by submerged timbers that it was necessary to place them in the dry docks for repairs. Both passenger and freight traffic, however, showed a decided increase during the month; 120,000 bushels of coal passed down through the lock at Davis Island during the month.

The rivers of West Virginia during June were low, almost too low for good navigation. The Ohio at Parkersburg changed but little during the month, the range being 4 feet. Until the 28th the stages were sufficient for all boats, but on that date the large packets were tied up, owing to the low water. A small rise on the 30th released them from the tie-up.

At Cincinnati the river continued slowly falling during the first eight days of the month, and a slight rise in the upper Ohio on the 9th and 10th came very opportunely, as the low water was becoming troublesome, and news of boats sticking was not infrequent. The rise, though slight, helped to keep the boats going. Although low water prevailed the greater part of the month, the stage was not as low as is generally expected at this season of the year, and navigation was maintained. The crest of a small but very helpful rise passed Cincinnati on the morning of the 24th, after which date the river steadily fell.

A good boating stage was maintained at Louisville throughout the month, the average being about 6 feet.

The lower Ohio fell from the 1st until the middle of the month, the fall continuing at Paducah until the 16th, and at Cairo until the 17th. A slight rise set in at Evansville on the 14th and continued until the 28th. This rise affected the stage at Paducah by the night of the 16th, brought the river to a stand at Cairo by the morning of the 18th, and with occasional slight rises out of the Cumberland and Tennessee, gave the river at Paducah and Cairo an upward tendency during the remainder of the month.

The Cumberland River fell steadily until the 24th, when a slight rise was in evidence. Navigation was open to lower points all the month, from Nashville to Carthage for the last three days, but above Carthage it was closed the entire month.

The Tennessee River was navigable during the entire month except at Bridgeport, where it was closed from June 1 to 11, and from the 14th to 22d. The few heavy rains over the upper Tennessee caused slight rises, which kept the river at a nearly normal stage at Chattanooga. The heavy rainfall of over two inches at Rogersville, Tenn., between 8 a. m. of the 25th and 8 a. m. of the 26th, gave a slight rise over the entire river. On July 19 a cloud burst occurred at Wallace, Va., 5 miles east of Bristol, Tenn. It caused an 8-foot tide in Beaver Creek, washing away a trestle and washing out 200 feet of track on the Norfolk and Western Railroad; trains were delayed; bottom lands were submerged at Bristol; no rain fell at the latter point. This is the first time since 1893 that the river has been navigable to all boats the entire month. The month closed with the river falling slowly, but with a splendid boating tide.

Mississippi River and minor branches. (Reported by P. F. Lyons, St. Paul, Minn.; M. J. Wright, Jr., La Crosse, Wis.; G. E. Hunt, Davenport, Iowa; F. Z. Gosewisch, Keokuk, Iowa; H. C. Frankenfield, St. Louis, Mo.; P. H. Smyth, Cairo, Ill; S. C. Emery, Memphis, Tenn.; R. J. Hyatt, Vicksburg, Miss.; R. E. Kerkam, New Orleans, La.; and C. Davis, Shreveport, La.)—The most satisfactory stage of water for navigation during any June since 1893 was maintained in the Mississippi River at St. Paul. Commencing on the 1st with a gauge reading of 5.2 feet, the minimum for the month, there were slight changes until at the end of the month the gauge indicated 6.4 feet, which was the maximum, and what boatmen consider a perfect "boating stage." It evidently has been appreciated as such, for the arrivals and departures of boats plying between St. Paul and other ports down to St. Louis, have been more regular and numerous, and the amount of business done more satisfactory than during any other June for several years back.

A good navigable stage of water was maintained at La Crosse during the month, the gauge readings ranging from 5.8 to 8.1 feet. A marked rise in the river occurred from the 8th to the 10th instants, caused by a decided rise in the Chippewa River during the early part of the month. The average stage of water for the month, 7.1 feet, was the highest for any June for the past four years, and has interfered somewhat with the river improvements which are now in progress.

At Davenport the water rose and fell in slight changes, never for many days at a time, but with a general upward tendency. The close of the month found the river higher than at the beginning. At no time did the river fall low enough to seriously interfere with navigation. The rainfall at Dubuque and southward to Muscatine was considerably below the normal; but that in the Mississippi Valley north of Dubuque was sufficient to maintain a good stage below.

The river at Keokuk has remained at a good stage for navigation, with small range, throughout the month, and with sufficient water for steamboats and lumber rafts in the channel on the Des Moines Rapids.

A very good boating stage was maintained at St. Louis throughout the month, and the frequent thunderstorms of the last week of the month caused a general rise, though not at all extensive, and the highest stage for the month at St. Louis occurred on the last day.

From St. Louis to Memphis the changes from day to day were slight; a good stage was maintained throughout the month.

At Memphis the river fell steadily from the 1st to the 20th, the gauge reading on that day being 11.8 feet, a fall of 5.4 feet. A rise set in on the 22d which continued to the close of the month, bringing the stage up to 15.7 feet, which was only 1.5 feet below that recorded on June 1. A good navigable stage was maintained throughout the month, and steamboat men report that the conditions were exceptionally favorable for boating business.

At Vicksburg the river fell below the danger line on the 4th for the first time since March 16. A steady fall continued throughout the month to a stage of 18.1 feet at its close, the total fall being over 25 feet. The water left the elevator gauge at Vicksburg on the 22d at a stage of 20 feet, and boats will land at the lower landing (Kleinston) for the present, the wharf boat having been moved to that point.

Below Vicksburg the river continued to decline during the entire month, the fall being 11 feet at New Orleans. The closing of the last crevasse (that at Conrad Point, below Baton Rouge) was completed on the night of the 7th. As fast as the water receded from the overflowed lands planting operations were resumed, and by the middle of the month all lands that had been under water had been replanted. Crops on these overflowed lands are promising at the close of the month.

Heavy local rains having fallen on several days during the first half of the month, sharp rises of short duration distinguished the upper portion of the Red River; the lower stream was devoid of interesting features, a gradual decrease having been maintained nearly the entire period. At Shreveport the month opened with a stage of 13.9 feet and closed with one of 9.8 feet.

A local rise of 10 feet in the Ouachita at Camden between the 3d and 7th, and the corresponding fall at that point, within a week thereafter left the upper Ouachita at a low stage during the greater portion of the month. The lower Ouachita fell rapidly during the entire month, the fall at Monroe amounting to about 19 feet between the 1st and the close of the month. Navigation continued in the Red and lower Ouachita during the entire month.

Missouri River and branches. (Reported by L. A. Welsh, Omaha, Nebr., and P. Connor, Kansas City, Mo.)—There has been no unusual stage of water in the Missouri River during the month. While the stage of water has been slightly above the normal, it has remained remarkably steady for this season of the year. The river was highest during the first half of the month, and fell very slowly during the last half. The entire range for the month was only 2 feet at Omaha. The river is making serious inroads upon the farm lands lying south of Manawa, which is about 5 miles south of Omaha, on the Iowa side. At one point the river cut inland a distance of 30 rods during the week from the 12th to the 19th, carrying with it hundreds of acres of the finest farm lands in the State. The cut is directly south of Manawa, where the river bends to the east. Last season more than 1,500 acres of valuable farm land, lying between Council Bluffs and Manawa, went into the river, and the people are very much alarmed to see the cutting process resumed this season. The riprap work on the east bank of the Missouri at Plattsmouth, done by the Burlington and Missouri Railroad Company, is reported to have checked the cutting at that point, and it is expected that the railroad company will do further work during the coming winter.

At Kansas City a moderately high stage was maintained all the month, fluctuating between 13.9 and 17.6 feet. A fortunate circumstance for this locality was that the excessive rains of the latter part of the month occurred in a belt from 100 to 200 miles south of the tributaries which affect the stage at this place; otherwise, there would have been another serious flood.

Arkansas River. (Reported by J. J. O'Donnell, Fort Smith, Ark., and F. H. Clarke, Little Rock, Ark.)—Westward from Fort Smith to Webbers Falls the Arkansas River was navigable during the month, falling steadily from the 5th to the 15th. On the morning of the 16th a rise of 0.2 feet was recorded, and a further rise of 4.8 feet on the 17th, after which the river again fell steadily to the close of the month, when the gauge registered 4.0, the lowest since February 6.

The river continued at a good boating stage from Fort Smith to the mouth throughout the entire month, and navigation was pursued uninterruptedly. A very uniform stage prevailed, there being no marked rises or falls, particularly in the lower river. The most marked rises were 3.0 feet at Dardanelle on the 18th and the same at Little Rock on the 20th.

Rivers on the Pacific Coast. (Reported by W. H. Hammon, San Francisco, Cal.; J. A. Barwick, Sacramento, Cal.; and B. S. Pague, Portland, Oreg.)—During the first part of the month the lower San Joaquin was high, owing to the melting of the snow in the mountains, but no damage resulted from the high water. The river is now about normal and is falling slowly.

There was a steady decline of the Sacramento river up to the 20th, when a storm passed over this section, lasting three days. During this time there were rains over the headwaters of the Sacramento river and its tributaries heavy enough to cause a rise from 14.3 feet on the 20th to 15.2 feet on the 23d. Since the latter date the river has steadily fallen.

The high waters which prevailed in May continued to decrease until the close of June. Owing to the warm weather of April and May over the Pacific Northwest, the rise in the Columbia and tributaries occurred much earlier than usual; as a rule, the highest water occurs about June 15. On the Willamette above Oregon City the river has fallen to a lower stage than is usual at this period of the year, making it somewhat difficult to navigate. The smaller streams have all furnished plenty of water for irrigation and mining purposes.

Heights of rivers above zeros of gauges, June, 1897.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn.	1,957	14	6.8	23	5.2	1	6.0	1.6
Reeds Landing, Minn.	1,887	12	6.7	22,23	4.3	2,4	5.6	2.4
La Crosse, Wis.	1,822	10	8.1	25-27	5.8	5	7.1	2.3
North McGregor, Iowa	1,762	18	9.0	29,30	6.3	8	7.6	2.7
Dubuque, Iowa	1,702	15	8.8	30	6.1	9	7.4	2.7
Leclaire, Iowa	1,612	10	5.4	29,30	4.0	11	4.8	1.4
Davenport, Iowa	1,596	15	6.8	25,26,30	5.0	11	5.9	1.8
Keokuk, Iowa	1,466	14	6.6	28,29	4.8	13,14	5.7	1.8
Hannibal, Mo	1,405	17	8.2	26	5.9	15	6.9	2.3
Grafton, Ill	1,307	23	11.1	30	7.3	16-19	8.5	3.8
St. Louis, Mo.†	1,264	30	21.8	30	14.4	22	16.2	7.4
Chester, Ill.	1,189	30	15.3	30	10.7	17,18,21	11.9	4.6
Cairo, Ill	1,073	40	23.2	30	16.6	17-19	18.9	6.6
Memphis, Tenn	843	33	17.2	1	11.8	20,21	13.6	5.4
Helena, Ark	767	44	26.8	1	16.7	22	19.7	10.1
Arkansas City, Ark.	685	42	34.0	1	17.8	22	22.0	16.2
Greenville, Miss	595	40	29.6	1	14.5	22	18.3	15.1
Vicksburg, Miss	474	41	43.4	1	18.1	28-30	27.7	25.3
New Orleans, La	108	16	18.0	1	7.2	29,30	12.8	10.8
Arkansas River.								
Fort Smith, Ark.	345	22	10.8	17	4.0	30	6.4	6.8
Dardanelle, Ark.	250	21	9.2	19	3.0	29,30	5.6	6.2
Little Rock, Ark.	170	23	10.3	20	5.3	29,30	7.5	5.0
White River.								
Newport, Ark	150	21	4.3	22	2.8	29,30	3.6	1.5
Illinois River.								
Peoria, Ill.	135	14	9.6	28	5.0	14,15	6.6	4.6
Missouri River.								
Bismarck, N. Dak.	1,201	14	8.9	6	6.9	27	7.8	2.0
Pierre, S. Dak.	1,006	14	8.6	1,2	6.6	16	7.6	2.0
Sioux City, Iowa	676	19	12.1	1	10.3	30	11.0	1.8
Omaha, Nebr.	561	18	12.6	3	10.7	20,21	11.7	1.9
St. Joseph, Mo.	373	10	9.1	5	6.9	22,23	8.0	2.2
Kansas City, Mo.	280	21	17.6	6	13.9	23-25	15.9	3.7
Boonville, Mo.	191	20	15.8	29	11.5	1	13.3	4.3
Hermann, Mo.	95	21	13.2	29	7.4	1	9.4	5.8
Ohio River.								
Pittsburg, Pa	966	22	6.7	23	1.7	3,4,7	4.2	5.0
Davis Island Dam, Pa.	960	25	5.7	30	2.7	30	4.3	3.0
Wheeling, W. Va.	875	36	7.9	9	3.6	30	5.2	4.3
Marietta, Ohio	795	25	8.0	10	4.4	29	5.8	3.6
Parkersburg, W. Va.	785	35	9.0	21	5.0	29	6.9	4.0
Point Pleasant, W. Va.	703	36	14.4	21	3.7	30	6.7	10.7
Catlettsburg, Ky	651	50	19.8	22	5.0	7,8	9.6	14.8
Portsmouth, Ohio	612	50	19.7	22	7.0	8	10.8	12.7
Cincinnati, Ohio	499	45	20.7	24	9.0	9,10	12.8	11.7
Louisville, Ky.	367	24	8.3	25	4.8	10-12	6.1	3.5
Evansville, Ind.	184	30	14.1	28	6.1	13,14	9.1	8.0
Mount Vernon, Ind.‡	148	35	14.0	28	7.6	18	10.1	6.4
Paducah, Ky.	47	40	12.0	29,30	5.9	16	8.0	6.1

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Alleghany River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Warren, Pa	177	7	0.5	9	0.0	19-30	0.1	0.5
Oil City, Pa	123	13	2.2	9	0.6	28-30	1.2	1.6
Parkers Landing, Pa.	73	20	2.6	9,10	0.8	{25,26, 29,30}	1.3	1.8
Freeport, Pa.	26	20	4.4	10	1.4	30	2.5	3.0
Conemaugh River.								
Johnstown, Pa.	64	7	2.0	18	1.0	30	1.4	1.0
Red Bank Creek.								
Brookville, Pa.	35	8	0.1	25	— 1.1	2-17	—0.9	1.2
Beaver River.								
Ellwood Junction, Pa.	10	14	3.6	8	— 0.1	29	0.5	3.7
Big Sandy River.								
Louisa, Ky.	26	20	12.0	20	3.4	6,7	6.3	8.6
Cumberland River.								
Burnside, Ky	434	50	4.0	28	0.5	18	1.6	3.5
Carthage, Tenn.	257	30	4.0	30	1.7	19	2.3	2.3
Nashville, Tenn	175	40	4.7	30	2.2	21	3.1	2.5
Great Kanawha River.								
Charleston, W. Va.	61	30	10.1	21	3.8	29	5.5	6.3
New River.								
Radford, Va.	158	14	1.5	10	0.3	19,20,30	0.6	1.2
Hinton, W. Va.	95	14	3.1	10	1.6	30	2.2	1.5
Licking River.								
Falmouth, Ky.	30	25	6.5	26	0.8	15,16	2.1	5.7
Miami River.								
Dayton, Ohio	69	18	3.1	19	1.3	17,18	1.7	1.8
Monongahela River.								
Weston, W. Va.	161	18						
Fairmont, W. Va	119	25	4.4	22	— 0.2	6-10	1.2	4.6
Morgantown, W. Va.	95	20	10.2	22	7.0	{3,6-8, 11-13,30}	7.7	3.2
Greensboro, Pa.	81	18	10.2	22	7.2	30	8.1	3.0
Lock No. 4, Pa.	40	28	10.5	22	6.5	{1-3,7,8, 11-14,30}	7.5	4.0
Cheat River.								
Rowlesburg, W. Va.	36	14	6.0	21	2.0	30	3.3	4.0
Youghiogheny River.								
Confluence, Pa.	59	10	1.8	4,5	0.7	28-30	1.1	1.1
West Newton, Pa.	15	23	1.5	20	0.4	16,17	0.7	1.1
Tennessee River.								
Knoxville, Tenn.	614	29	4.4	24	1.7	19	2.9	2.7
Rockwood, Tenn	519	20						
Chattanooga, Tenn.	430	33	6.2	26,29	3.3	19,20	4.6	2.9
Bridgeport, Ala	390	24	4.7	29	1.7	20	2.8	3.0
Florence, Ala.	220	16	3.3	28,29	1.5	22,23	2.4	1.8
Johnsonville, Tenn.	94	21	4.8	30	2.9	24	4.0	1.9
Wabash River.								
Terre Haute, Ind.	165	16	10.2	21	1.7	17	3.8	8.5
Mt. Carmel, Ill.	50	15	8.5	23	3.3	20	4.7	5.2
Red River								
Arthur City, Tex.	668	27	14.0	19	3.5	14	7.7	10.5
Fulton, Ark	565	28	16.8	21	7.5	30	12.0	9.3
Shreveport, La.	449	29	13.9	1	9.8	30	12.1	4.1
Alexandria, La.	139	33	17.5	1	10.0	30	13.8	7.5
Atchafalaya River.								
Melville, La.	100*	31	35.2	1	23.0	30	30.4	12.2
Ouachita River.								
Camden, Ark.	340	39	14.1	7	4.1	29,30	6.4	10.0
Monroe, La	100	40	28.2	1	8.9	30	20.7	19.3
Yazoo River.								
Yazoo City, Miss.	80	25	27.5	1	0.9	30	15.1	26.6
Tombigbee River.								
Columbus, Miss.	285	33	— 1.6	4	— 2.9	30	—2.4	1.3
Demopolis, Ala.	155	35	2.7	6	— 1.4	30	0.2	4.1
Black Warrior River.								
Cordova, Ala	155	20	2.0	1,2,5-7	0.6	29,30	1.4	1.4
Tuscaloosa, Ala.	90	38	3.4	7	— 0.1	30	1.2	3.5
Alabama River.								
Montgomery, Ala.	265	35	2.0	8,9	0.5	30	1.4	1.5
Selma, Ala.	212	35	2.3	1	0.8	30	1.5	1.5
Coosa River.								
Rome, Ga	225	30						
Wilsonville, Ala	66	15						
Savannah River.								
Augusta, Ga	130	32	11.7	10	5.9	29	7.5	5.8
Edisto River.								
Edisto, S. C	75	6	4.5	11	1.4	2-5	2.8	3.1
Congaree River.								
Columbia, S. C.	37	15	10.7	9	1.5	1-4,13-30	2.4	9.2
Santee River.								
St. Stephens, S. C.	50	12	8.3	19-20	2.9	2	2.6	5.4
Wateree River.								
Camden, S. C.	45	24	20.0	9	4.2	30	6.6	15.8
Black River.								
Kingstree, S. C.	60	12	4.2	11	1.8	29	3.2	2.4
Pedee River.								
Cheraw, S. C.	145	27	16.0	9	2.4	27	4.5	13.6
Lynch Creek.								
Effingham, S. C.	35	12	8.0	17	3.1	4	5.1	4.9
Lumber River.								
Fair Bluff, N. C.	10	6	4.2	15	0.7	2,3,30	2.2	3.5
Waccamaw River.								
Conway, S. C	40	7	3.5	19	1.4	26	2.6	2.1
Cape Fear River.								
Fayetteville, N. C.	100	38	8.6	2	1.8	25	4.5	6.8
James River.								
Lynchburg, Va.	257	18	1.6	20	0.3	30	0.9	1.3
Richmond, Va.	110	12	1.0	7,19	— 0.2	16,29	0.3	1.2
Potomac River.								
Harpers Ferry, W. Va.	170	16	1.4	{1,2,10, 22,23}	1.0	{15-19, 29,30}	1.2	0.4
Susquehanna River.								
Wilkesbarre, Pa.	178	14						
Harrisburg, Pa.	70	17	3.5	14	1.5	30	2.4	2.0

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger-line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
W. Br. of Susquehanna.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Lock Haven, Pa	63	10	1.0	1,2	0.3	16–23	0.6	0.7
Williamsport, Pa	35	20	2.4	4	1.0	30	1.5	1.4
Juniata River.								
Huntingdon, Pa	80	24	3.5	1,21	3.0	11–20, 22–24, 26–30	3.1	0.5
Sacramento River.								
Redbluff, Cal	241	23	2.9	21	1.0	14–18, 27–30	1.6	1.9
Sacramento, Cal	70	25	19.6	1	13.9	30	16.0	5.7

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Willamette River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Eugene, Oreg	149	10	4.4	27	2.6	12–14	3.2	1.8
Albany, Oreg	99	20	4.3	28	2.6	12–14	3.2	1.7
Salem, Oreg	69	20	4.2	28	2.6	10–16	3.2	1.6
Portland, Oreg	10	15	22.8	1,2	15.0	19,26–30	17.9	7.8

*Distance to the Gulf of Mexico. †Record for 29 days. ‡Record for 19 days.

SPECIAL CONTRIBUTIONS.

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TEMPERATURE AND RAINFALL AT MERSIVAN, TURKEY.

The following table of monthly and annual means gives the results of observations made under the direction of J. J. Manissadjian, Professor of Physical Science, Anatolia College, Merzifun (Mersivan or Marsovan), Turkey in Asia. The location of the observatory is: Latitude 40° 50′ N., longitude 35° 40′ E. The temperatures were observed at 8 a. m., 1:15 p. m., and 6:30 p. m., besides the daily maximum and minimum. No details are given as to the method followed in combining these observations so as to obtain daily and monthly mean temperatures. Owing to the high mountains north and east of the station, the climate must be quite local in its characteristics.

Month.	Mean temperature.						Extreme temperatures.				Total rainfall.			
							Maxima.		Minima.					
	1892.	1893.	1894.	1895.	1896.	Mean.	Temperature.	Date.	Temperature.	Date.	1895.	1896.	1897.	Mean.
	°C.	°C.	°C.	°C.	°C.	°C.	°C.		°C.		*mm.*	*mm.*	*mm.*	*mm.*
Jan. .	2.2	2.1	0.5	6.5	0.6	2.4	22.5	30, '95	—14	31, '93	.....	10.1	24.1	17.1
Feb.	2.7	—1.1	0.2	6.4	0.5	1.7	19	14, '95	—19	10, '93	.....	3.9	26.7	15.3
March	8.2	4.7	5.4	6.5	5.5	6.1	22	22, '96	— 6	24, '93	.....	31.0	24.4	27.7
April	9.0	5.0	11.2	10.6	2.3	9.0	25	30, '96	— 6	3, '93	.....	37.3	56.4	46.8
May	13.5	16.2	17.8	13.6	15.5	15.3	32.5	28, '95	+ 2	1, '95	.....	93.8	91.2	92.5
June	18.8	19.6	20.3	19.1	20.3	19.4	35	12, '96	7.5	1, '95	44.2	70.7	.....	57.4
July	20.0	23.0	21.9	23.5	22.8	22.2	34	9, '95	3.0	3, '92	.....	33.2	.....	33.2
August	20.4	21.8	22.0	22.9	24.5	22.3	37.5	6, '95	9.5	30, '95	21.6	10.1	.....	15.8
Sept.	18.1	17.4	17.2	16.3	20.4	17.9	32.5	8, '94	2.5	24, '95	40.4	59.8	.....	50.1
Oct.	16.9	14.7	16.9	15.8	17.4	16.3	31	26, '92	1	27, '93	40.9	8.8	.....	24.8
Nov.	7.2	11.3	6.7	9.3	8.9	8.6	26	7, '93	— 5.5	26, '92	6.8	47.9	.....	27.4
Dec.	5.1	4.1	3.5	5.2	4.8	4.6	20	2, '96	— 9	3, '96	13.5	19.4	.....	16.4
Means	11.7	11.9	12.0	13.2	12.6	12.3	.....	.....	.....	.....	.....	427.0	.....	424.5

Temperature extremes: Maximum, 37.5°, August 6, 1895; minimum, —19°, February 10, 1893.

WHIRLING ALTO-STRATUS.

By Mr. ALEXANDER G. MCADIE, Local Forecast Official (dated March 15, 1897).

Accompanying this are two photographs (see attached plate) of a whirling alto-stratus cloud which appeared over San Francisco on February 20, 1897, at 12 m. (seventy-fifth meridian time?). About thirty seconds elapsed between the two pho-